The invention also relates to a handover method in a mobile telecommunications system said method comprising:

allocating the mobile station at least two parallel traffic channels for high-speed data transmission over the radio path between a mobile station and a base station of a fixed radio network,

measuring the characteristics of the received data signal, such as signal level and/or quality, at the mobile station in each of said allocated traffic channels, making a handover decision on the basis of a combination of measurement results of two or more of said allocated traffic channels, or on the basis of a measurement result of the poorest one of said allocated traffic channels.

The invention also relates to a control arrangement of a mobile station in a mobile telecommunications system for transmitting data over the radio path between a mobile station and a base station of a fixed radio network, said arrangement comprising

the fixed network being arranged to allocate to a mobile station can be allocated at least two traffic channels for high-speed data transmission,

a mobile station being arranged to measure the characteristics of the received signal, such as signal level and/or quality, in each of said allocated traffic channels, and

the fixed radio network being arranged to control the transmitting power of a base station and/or make a handover decision on the basis of a combination of measurement results of two or more of said allocated traffic channels, or on the basis of a measurement result of the poorest one of said allocated traffic channels.

The invention employs a so-called multi-channel technique so that a mobile station has access to two or more traffic channels for one data call. The high-speed data signal to be transmitted over the radio path is split into a required number of data signals of lower speed, each signal being transmitted through respective one of the allocated traffic channels. As soon as the data signals of lower speed have separately been transmitted over the radio path, they are again at the receiving end combined into the original high-speed signal. This is how the data transfer rate can be doubled, tripled, etc., depending on whether two, three or more traffic channels are assigned to be used by a subscriber. In a GSM system, for example, two traffic channels (time slots) will enable a data transfer speed of 2×9.6 kbit/s which is enough for a modem of 14.4 kbit/s, or a telefax terminal, for example. Six time slots will enable a data transfer rate of 64 kbit/s.

The multi-channel technique in according to the invention, in which a high-speed data signal is transmitted as several lower-speed signals through several parallel traffic channels, has many advantages over an alternative approach in which a mobile station is assigned a single higher-capacity traffic channel having higher maximum data transmission speed than a standard traffic channel. In TDMA systems, for example, a high-speed data signal may be transmitted as several bursts in several time slots within one frame, whereas in an alternative approach in which a mobile station may be assigned several time slots in the same frame for data transmission, but the whole data signal is transmitted as one burst extended for the time of the assigned time slots. In the present invention, there is no need to change the other significant characteristics of the physical transmission path, eg. radio path and traffic channel structure. In TDMA systems, for example, these characteristics may include (at radio interface, for example, Layer 1 of GSM), such as frequency division, frame format and time slot configuration, data transfer rate, error correction, modulation, format of a TDMA burst, bit error ratio (BER), etc. In other words, the present invention allows to support different kind of subscriber data transfer rates in the radio system by a single structure of a physical transmission path. Consequently there is no need to support several structures of a physical transmission path by the subscriber terminals, either.

The multi-channel technique of the invention enables each traffic channel allocated to a mobile station to be handled as an independent traffic channel with regard to measurements, transmitting of measurement reports, and power control. Each traffic channel is measured independently. In the primary embodiment of the invention, it is possible to carry out the power control and the reporting of measurement results independently for each traffic channel by associating an individual, parallel control channel with each traffic channel. This is advantageous, because the signal quality can vary considerably in different traffic channels due to, for example, different interference conditions. By the split power control, a more optimal multi-channel system can be obtained with regard to power used and the quality of the received signal. An optimized use of transmitting power means a lower average transmitting power, which leads to a longer battery life. The average interference level in the system is also decreased resulting in a higher system capacity.

In a second embodiment of the invention, all the traffic channels have their own control channels through which measurement reports are transmitted, but power control is performed for each channel through only one single control channel in the direction from the fixed network to a mobile station. Similar kinds of improvements in the performance of the system, albeit of less importance, are obtained by using a common, parallel control channel for all traffic channels assigned to a mobile station so that a combination of measurement results of all of the allocated traffic channels, for example, average value, is transmitted to the fixed radio network over the common control channel. The fixed radio network controls the transmitting power of the mobile station through the same common control channel.

The reliability of handover decisions can also be improved in a multi-channel system in cases every traffic channel assigned to a mobile station is independently measured in accordance with the invention, and the handover decision is made on the basis of a combination of the measurement results, such as average value, or on the basis of the poorest one of the allocated traffic channels.

In TDMA systems, the implementation may be especially simple if adjacent time slots are employed. Consequently, it will be easier to carry out various measurements the remaining part of the frame, and increasing the number of frequency synthesizers in the receiver of the mobile station is avoided. In the GSM system, it is especially advantageous to implement the invention by two time slots.

In CDMA systems there may be a multi-channel connection only in one direction, from a base station to a mobile station. The measurements reported by the mobile station allow a control of the transmission power of the base station on the allocated traffic channels.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following, the invention will be described in greater detail by the primary embodiments with reference to the accompanying drawings in which

FIG. 1 illustrates a section of a mobile system in which the invention can be applied, and